The Claims Defining the Invention are as Follows:

1. A method for fabricating a tunable cavity resonator having a pair of reflectors, one being disposed in fixed relationship to a substrate material and the other being a suspended moveable membrane disposed a cavity length from the one reflector, and a pair of electrodes either being constituted by the reflectors or being juxtaposed therewith, one electrode with the one reflector and the other electrode with the other reflector, the method comprising:

   depositing a first reflector layer on a substrate to form the one reflector of the cavity resonator;

   forming a sacrificial layer of a prescribed material having a high etch selectivity for releasing the membrane in a suspended and spaced relationship from the one reflector;

   forming the membrane on the sacrificial layer using a deposition technique characterised by providing the required intrinsic stress in the membrane;

   depositing a second reflector layer on the membrane to form the other reflector;

   patterning the second reflector layer in accordance with a prescribed membrane geometry;

   etching the second reflector layer and the membrane to achieve said prescribed membrane geometry; and

   etching the sacrificial layer to to release the membrane and suspend it in substantially parallel relation to the first reflector layer.

2. A method as claimed in claim 1, including the step of forming recesses for the support locations in the sacrificial layer down to the substrate, after forming the sacrificial layer and prior to forming the membrane thereon;

extending the membrane layer to cover the sacrificial layer and the exposed substrate within the recesses during the forming of the membrane;

extending the second reflector layer to cover the membrane layer within the recesses during the forming of the second reflector layer; and

etching the sacrificial layer to remove it from around the membrane, so that the membrane and reflector layers are disposed with the recesses are revealed to constitute the support structure for suspending the membrane and the second reflector above the substrate.

3. A method as claimed in claim 1 or 2, including initially etching the sacrificial layer to remove regions thereof down to said first reflector layer on the substrate exposed by said etching.

4. A method as claimed in claim 3, including protecting those regions of the sacrificial layer intended to function as the residual support structure of the membrane.

5. A method as claimed in any one of the preceding claims, including finally etching the remaining unprotected regions of the sacrificial layer to release the membrane and suspend it by the support structure in substantially parallel relation to the first reflector layer.

6. A method as claimed in claim any one of the preceding claims, including forming the substrate material as a semiconductor system that provides access to the optical wavelengths necessary for resonance purposes in the resonant cavity.

7. A method as claimed in claim 6, including forming the sacrificial layer of a thickness such that the resultant cavity length so formed allows filtering of radiation having optical wavelengths in the infrared region.

8. A method as claimed in any one of the preceding claims, including forming the suspended moveable membrane with sufficient resiliency so that it may be displaced to an extent that is commensurate to the full cavity length, but such displacement is controllable to be marginally less than the full cavity length to avoid the membrane contacting the one reflector.

9. A method as claimed in any one of the preceding claims, including forming the membrane of silicon nitride.

10. A method as claimed in any one of the preceding claims, including forming the sacrificial layer of zinc sulphide.

11. A method as claimed in any one of the preceding claims, including forming the substrate from an infrared sensitive material.

12. A method as claimed in claim 11, including forming the substrate of mercury cadmium telluride (MCT).

13. A method as claimed in any one of the preceding claims, including forming the membrane using PECVD.

14. A method as claimed in any one of the preceding claims, including forming the electrodes separately of the reflective layers.

15. A method as claimed in any one of claims 1 to 13, including forming the reflective layers to function as electrodes.

16. A method as claimed in any one of the preceding claims, including etching the second reflector layer using an anisotropic etching process.

17. A method as claimed in claim 16, including dry etching the second reflector layer.

18. A method as claimed in claim 17, including plasma etching the second reflector layer.

19. A method as claimed in claim 18, including reactive ion etching the second reflector layer.

20. A method as claimed in any one of the preceding claims, including initially etching the sacrificial layer using an isotropic etching process.

21. A method as claimed in claim 20, including initially dry etching the sacrificial layer.

22. A method as claimed in any one of the preceding claims, including protecting the support structures with photoresist.

23. A method as claimed in any one of the preceding claims, including finally etching the remaining unprotected regions of the sacrificial layer using an isotropic etching process.

24. A method as claimed in claim 23, including wet etching the remaining unprotected regions of the sacrificial layer.

25. A tunable cavity resonator fabricated according to the method as claimed in any one of claims 1 to 24.

26. A tunable cavity resonator comprising:

a substrate material;

a moveable membrane disposed in substantially parallel relationship to said substrate and suspended relative thereto at the periphery of the membrane by a support structure;

a pair of reflectors, one being a first reflector layer disposed in fixed relationship upon the substrate material and the other being a second reflector layer disposed on the suspended deformable membrane to form a resonant cavity, the reflectors being disposed a cavity length from each other;

the membrane and one reflector being shaped in accordance with a prescribed membrane geometry; and

a pair of electrodes either being constituted by the reflectors or being juxtaposed therewith, one electrode with the one reflector and the other electrode with the other reflector;

wherein the suspended moveable membrane is of substantially uniform thickness and has an intrinsic stress to permit electrostatic displacement of the membrane over relatively large distances using relatively low voltages applied to the electrodes.

27. A resonator as claimed in claim 26, wherein said substrate material is a semiconductor system that provides access to the optical wavelengths necessary for resonance purposes in the resonant cavity.

28. A resonator as claimed in claim 27, wherein said cavity length corresponds to optical wavelengths in the infrared region.

29. A resonator as claimed in any one of claims 26 to 28, wherein the displacement of the suspended moveable membrane can be up to the full cavity length, which is correspondingly larger to accommodate such displacement without the membrane contacting the one reflector.

30. A resonator as claimed in any one of claims 26 to 29, wherein said membrane is formed of silicon nitride.

31. A resonator as claimed in any one of claims 26 to 30, wherein said support structures are formed of zinc sulphide.

32. A resonator as claimed in any one of claims 26 to 30, wherein said substrate is formed from an infrared sensitive material.

33. A resonator as claimed in claim 32, wherein substrate is formed of mercury cadmium telluride (MCT).

34. A resonator as claimed in any one of claims 26 to 33, wherein said electrodes are formed separately of the reflective layers.

35. A resonator as claimed in any one of claims 26 to 33, wherein reflective layers are formed to function as electrodes.

36. A method for fabricating a tunable cavity resonator for filtering incident radiation with longer photonic wavelengths from applications where the wavelengths may be in the order of less than 1 micron to applications where the wavelengths may be greater than 20 microns, the cavity resonator having a pair of reflectors, one being disposed in fixed relationship to a substrate material and the other being disposed on a moveable membrane suspended by a support structure and disposed a cavity length from the one reflector, to form a Fabry Perot (FP) cavity, and a pair of electrodes either being constituted by the reflectors or being juxtaposed therewith, one electrode with the one reflector and the other electrode with the other reflector, to control the movement of the membrane in response to a prescribed dc voltage applied across electrodes, the method comprising:

forming the membrane on a sacrificial layer using a plasma deposition technique at a sufficiently low temperature with a gas flow ratio and prescribed RF frequency and power to excite the plasma so that the resultant stress in the membrane when released from the sacrificial layer and suspended by the support structure is controllable and very low, and the pinhole density in the membrane is sufficiently low to provide the membrane with the requisite integrity and morphology to exhibit a near-ideal Fabry Perot response.

37. A method as claimed in claim 36, including fabricating the cavity resonator to function as a filter applicable for detecting incident radiation of wavelengths in ranges, whereby the wavelength of resonance can be in the region of 100nm or 1,000,000nm.

38. A method as claimed in claim 36 or 37, including forming the membrane of silicon nitride.

39. A method as claimed in any one of claims 36 to 38, including forming the sacrificial layer of zinc sulphide.

40. A method as claimed in any one of claims 36 to 39, including forming the substrate from an infrared sensitive material.

41. A method as claimed in claim 40, including forming the substrate of mercury cadmium telluride (MCT).

42. A method as claimed in any one of claims 36 to 41, including forming the membrane using PECVD.

43. A method as claimed in any one of claims 36 to 42, including matching the temperature of the deposition to the tolerance of the materials constituting the sacrificial layer and the substrate.

44. A method as claimed in any one of claims 36 to 43, including selecting the gas flow ratio at the desired deposition temperature to achieve the requisite intrinsic stress at a prescribed RF frequency and power that still provides the membrane with the requisite integrity and morphology to maintain a high yield process.

45. A method as claimed in claim 44, including setting the gas flow ratio to comprise an appropriate ratio of silane to ammonia to a diluting gas so as to achieve the required level of intrinsic stress that can result in virtually zero stress in the released membrane.

46. A method as claimed in any one of claims 36 to 45, including forming the electrodes separately of the reflective layers.

47. A method as claimed in any one of claims 36 to 45, including forming the reflective layers to function as electrodes.

48. A method as claimed in any one of claims 36 to 47, including etching the second reflector layer using an anisotropic etching process.

49. A method as claimed in claim 48, including dry etching the second reflector layer.

50. A method as claimed in claim 49, including plasma etching the second reflector layer.

51. A method as claimed in claim 50, including reactive ion etching the second reflector layer.

52. A method as claimed in any one of claims 36 to 51, including etching the sacrificial layer to release the membrane and suspend it by the support structure in substantially parallel relationship to the first reflector layer.

53. A method as claimed in claim 52, including the step of forming recesses for support structure locations of in the sacrificial layer down to the substrate, after forming the sacrificial layer and prior to forming the membrane thereon;

extending the membrane layer to cover the sacrificial layer and the exposed substrate within the recesses during the forming of the membrane;

extending the second reflector layer to cover the membrane layer within the recesses during the forming of the second reflector layer; and

etching the sacrificial layer to remove it from around the membrane, so that the membrane and reflector layers are disposed with the recesses are revealed to constitute the support structure for suspending the membrane and the second reflector above the substrate.

54. A method as claimed in any one of claims 36 to 53, including initially etching the sacrificial layer using an isotropic etching process.

55. A method as claimed in claim 54, including initially dry etching the sacrificial layer to form the support structure.

56. A method as claimed in claim 55, including protecting the support structure with photoresist.

57. A method as claimed in any one of claims 36 to 56, including finally etching the remaining unprotected regions of the sacrificial layer using an isotropic etching process to release the membrane and suspend it by the support structure.

58. A method as claimed in claim 57, including wet etching the remaining unprotected regions of the sacrificial layer.

59. A method for fabricating a tunable cavity resonator substantially as described herein in accordance with any one of the embodiments.

60. A tunable cavity resonator substantially as described herein in accordance with any one of the embodiments.